

Synopsis of Prior Spacecraft

TIROS-N was launched October 13, 1978, into a 470-nmi (870-km) orbit and was the first in the series of a fourth-generation operational environmental satellite system. TIROS-N was a research and development spacecraft serving as a protoflight for the operational follow-on series, NOAA-A through N' spacecraft. The spacecraft was deactivated following an Inertial Measurement Unit (IMU) power supply failure on February 27, 1981.

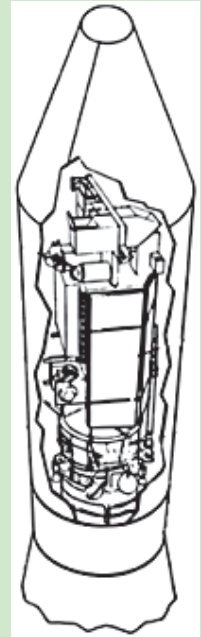
NOAA-A (6) was launched June 27, 1979, into a 450-nmi (833-km) orbit. The HIRS, a primary mission sensor, failed September 19, 1983. The satellite greatly exceeded its two-year lifetime and was totally deactivated on March 31, 1987, after nearly eight years of operational service.

NOAA-B was launched May 29, 1980, and failed to achieve a usable orbit because of a booster engine anomaly.

NOAA-C (7) was launched June 23, 1981, into a 470-nmi (870-km) orbit. The HIRS, a primary mission sensor, failed February 7, 1985. The spacecraft was deactivated in June 1986 following a failure in the power system.

NOAA-E (8) was launched March 28, 1983, into a 450-nmi (833-km) orbit. It was the first of the ATN satellites and included a stretched structure to provide growth capability; it also included the first SAR package. The redundant crystal oscillator (RXO) failed after 14 months in orbit. The RXO recovered from its failure, finally locking up on the backup RXO in May 1985. The satellite was stabilized and declared operational by NOAA on July 1, 1985. NOAA-E (8) was finally lost on December 29, 1985, following a thermal runaway that destroyed a battery.

NOAA-F (9) was launched December 12, 1984, into a 470-nmi (870-km) afternoon orbit. The MSU, a primary mission sensor, failed May 7, 1987. The Digital Tape Recorder (DTR) 1A/1B failed two months after launch. The Earth Radiation Budget Experiment (ERBE) scanner stopped outputting science data in January 1987. Earlier in the mission, the AVHRR periodically exhibited anomalous behavior in its synchronization with the Manipulated Information Rate Processor (MIRP). The SBUV/2 and the Stratospheric Sounding Unit (SSU) instruments aboard continued to operate satisfactorily. The satellite also had real-time and global Search and Rescue (SAR) on board. The Microwave Sounding Unit (MSU) channels 2 and 3 failed, and the satellite's power system was degraded. In August 1995, a very high power overvoltage condition resulted in the failure of the MIRP, the AVHRR, Battery #1 charge regulator, and IMU temperature control amplifier. The MIRP failure also resulted in the loss of the global SAR data via the Global Area Coverage (GAC) data stream. The satellite's ability to collect, process, and distribute SBUV/2, SSU, and ERBE-Non-



POES in launch configuration

scanner (NS) data was now limited to stored TIROS Information Processor (TIP) data. The SARR transmitter failed on December 18, 1997. The satellite was deactivated on February 13, 1998.

NOAA-G (10) was launched September 17, 1986, into a 450-nmi (833-km) morning orbit. The ERBE-Scanner exhibited a scan sticking anomaly that is apparently generic to the instrument. The SAR Processor (SARP) 406 MHz receiver also failed. The SARP was used to provide global SAR data before its failure. In December 1994, the AVHRR IR channels were damaged and remained severely degraded from a satellite tumble caused by an overflow of the satellite's ephemeris clock. NOAA-10 was placed in standby on September 17, 1991 (the date NOAA-12 became

fully operational). In January 1997, the MSU scanner displayed anomalous readings. The telemetry indicated that the digital encoder failed. The MSU scanner motor was commanded off in February 1997. A MIRP-related missing minor frame anomaly occurred in August 1998. The HRPT data is unusable due to an unstable MIRP and a faulty AVHRR. The satellite was deactivated on August 30, 2001.



This computer-generated image of the continents with the vegetation of the Earth superimposed over it is based on data provided by the AVHRR, aboard the NOAA-7, -8, and -11 satellites

NOAA-H (11) was launched September 24, 1988, into a 470-nmi (870-km) afternoon orbit. The AVHRR, a primary mission sensor, failed September 13, 1994. It is currently in a standby operational mode transmitting global and real-time SAR data directly to local users around the world. The NOAA-H (11) was modified for a 0° to 80° Sun angle and includes fixed and deployable sunshades on the Instrument Mounting Platform. The increase of maximum Sun angle from 68° to 80° allows an afternoon nodal cross-

ing closer to noon to enhance data collection. The SSU instrument and the power subsystems operate satisfactorily. In October 1994, the SBUV/2 diffuser failed; however, the instrument continues to collect global ozone data. In April 1995, DTRs 1B and 5A/B failed to operate. Two gyros have failed and attitude control is being maintained through the use of new reduced gyro flight software. In addition, before the NOAA-D launch, a gyroless flight software package was installed on NOAA-11 to provide attitude control, at expected reduced accuracy, should the X-gyro fail. The satellite was placed in standby mode in March 1995, and was reactivated to provide soundings after a NOAA-12 HIRS filter wheel anomaly in May 1997. The MSU stopped scanning in February 1999. The MSU science data is no longer usable, so the instrument was powered off in March 1999. The HIRS filter wheel stopped moving on April 13, 2000. The HIRS instrument was subsequently turned off on April 26, 2000.

NOAA-D (12) was launched on May 14, 1991, into a 450-nmi (833-km) morning orbit and is currently the semi-operational backup morning satellite. It replaced NOAA-G (10) in orbit; however, it does not have a SAR package on board. The Skew Gyro periodically exhibits a high drift rate, which is corrected with real-time operational command procedures. In May 1997 the HIRS filter wheel mechanism degraded to the point that soundings were unusable. The remaining instruments and other subsystems continue to operate satisfactorily. NOAA-12 was placed in standby mode on December 14, 1998, when NOAA-15 became operational.

NOAA-I (13) was launched on August 9, 1993, into a 470-nmi (870-km) afternoon orbit. On August 21, 1993, two weeks after launch, the spacecraft suffered a power system anomaly. All attempts to contact or command the spacecraft since the power failure have been unsuccessful.

NOAA-J (14) was launched on December 30, 1994, into a 470-nmi (870-km) afternoon orbit and is currently designated the backup afternoon satellite. A few hours after launch, a GN_2 regulator valve leak caused the spacecraft to experience an attitude anomaly. The satellite was recovered within hours and remains in a stable orbit. In January 1995, it was determined that one of the four Space Environment Monitor (SEM) telescopes was inoperative, reducing data collected by 12 percent. In February 1995, the SARP failed, the SBUV/2 Cloud Cover Radiometer (CCR) failed, and DTR 4A/4B was deemed inoperable. Also, the ESA exhibited high Quadrant 3 (Q3) data counts due to apparent contamination of the detector. In March 1995, the MSU scanner seized and the instrument was powered off. After three weeks, the MSU was powered on and has been operating satisfactorily since. Flight software was modified in April 1995, to correct the high ESA Q3 counts and to turn off the MSU should the scanner seize up again. Between April 1995 and December 1996 the SBUV grating drive experienced significant degradation. The grating drive control was reprogrammed to compensate for these problems as well as for the CCR failure. All other instruments operate satisfactorily. In November 1995, the Demodulator portion of the Command Receiver and Demodulator (CRD) for On-board Processor #1 (OBP1) failed, resulting in the loss of the backup OBP. OBP1 was commanded off. Flight software and ground software packages were modified to permit the use of and commanding to only OBP2. On October 18, 2001, the AVHRR scanner became unstable, rendering its imagery unusable. NOAA-L (16) replaced NOAA-J (14) as the operational afternoon satellite on March 19, 2001.

NOAA-K (15) was launched on May 13, 1998, into a 450-nmi (833-km) morning orbit and is currently the designated operational morning satellite. It replaced NOAA-D (12) on December 14, 1998, as the primary morning spacecraft. The STX-1, STX-2, and STX-3 high-gain S-band antennas have shown degraded performance in orbit. Beginning September 28, 1999, the satellite was configured to transmit HRPT using the STX-2 omnidirectional antenna and transmit data playbacks using STX-4. The STX-1 and STX-3 downlinks are not used. Since the NOAA-15 launch, the AMSU-B instrument has had a bias in the science data that has been corrected by software processing on the ground. This bias is caused by interference from the L-band and S-band trans-

mit systems on-board the spacecraft. With the use of the omnidirectional antennas and only the STX-2 and STX-4 S-band downlinks, the interference can be modeled to remove the bias to the science data. AMSU-B instruments on NOAA-L and later spacecraft have been modified to correct this bias. Gyro 3 was turned off in June 2000, due to excessive drift in the gyro. The AVHRR scan motor is showing degraded performance that started on May 30, 2000. The AVHRR products are marginally usable. The AMSU-A1 channel-14 detector amplifier stage failed on October 30, 2000. Data from that channel is unusable. Other AMSU-A1 channels are fine. The SARR 243-MHz receive system developed a thermal-related intermittent failure beginning on December 5, 2000. An antenna subsystem is the most likely cause.

NOAA-L (16) was launched on September 21, 2000, into a 470-nmi (870-km) afternoon orbit. It is currently the designated operational afternoon satellite. It replaced NOAA-J (14) on March 19, 2001, as the primary afternoon spacecraft. The Automatic Picture Transmission (APT) VHF downlink showed a severely degraded performance starting on November 13, 2000. A hybrid failure in the VRA antenna subsystem is the most likely cause of the degradation. The APT downlink was commanded off on February 26, 2001. A HIRS instrument cross-track pointing error has been observed since launch. The problem was traced to a prelaunch ground test incident. Data processing procedures were developed to correct for instrument misalignment. The STX-3 output power dropped to 1 watt on September 28, 2001. The link is still usable by the NOAA CDAS.